Knowing the implicit confidence in the effectiveness of this kind of concealment, which is instructive in all creatures furnished with the necessary apparatus, I proceeded to try and test this very curious psychological accompaniment of the physical machinery. I advanced in the full sunlight close up to the moth —so close that I could see the prominent "beaded eyes" with the watchful look—and the roughened outlines of the thorax, which served to complete the illusion. So perfect was the deception that I really could not feel confident that the black spot I was examining was what I believed it to be. Only one little circumstance reassured me. There was some hole or interstice in the outer covering, through which one spot of the inner brilliant margin could be seen shining like a star. Certain now as to the identity of the moth, I advanced still nearer, and finally I found that it was not till the point of a stick was used to move and shake the earth on which it lay, that the creature could believe that it was in danger. Then, in an instant the crumpled leaf became a living moth with powers of flight, which would have defied capture.

I recollect that many years ago Mr. Wallace kindly showed me a butterfly from the Eastern Archipelago whose upper wings were of a brilliant colour, but which, by the simple act of alighting on a branch, and of folding or closing its wings, became transformed into the perfect likeness of a growing leaf—a likeness so perfect that even the closest inspection only discovered new items of resemblance—inasmuch as the leaf-stalk, as well as the venation of the leaf, were all perfectly represented both in the structure and in the colouring of the under-surface of the wings.

I confess that the number and intricacy of the correlated growth and instincts which are involved in these phenomena strike me more and more as wholly outside the sphere of mere physical causation—by which I do not mean that physical causation has not had its own share of instrumentality in the matter, but that it affords no satisfying explanation of all the elements involved. The ordinary phrases of the Natural Selection Theory appear in the light of such facts to be little better than lean and empty formulæ. ARGYLL

Cannes, November 29

Double Flowers

I AM indebted to Baron von Mueller for the communication of double flowers of *Tetratheca ciliata*, which possess interest on several grounds, although the changed appearances they present are not infrequent. It may be well to premise (1) that the plant, like all its fellows of the same order (Tremandraceæ), is native to extra-tropical Australia; (2) that, under ordinary circumstances, it has 4 free sepals, 4 free petals, 8 free stamens in a single row, and a two-celled ovary; (3) that "doubling," in a strict sense, is brought about by the multiplication of petals, or by the more or less complete substitution of petals for stamens, or pistils, or both.

The Australian origin of the plant in question is so far of interest, in this connection, that it affords one more illustration of the occurrence, under natural conditions, of double flowers in a division of the globe where, according to the late Dr. Seemann, such forms are rare. The rarity, however, I believe, is not so much in the existence of such flowers, as in the number of observers, at any rate we now know of several cases of the kind.

Some of the flowers sent by Baron von Mueller were double by multiplication of petals, *i.e.* there was a second row of petals inside the first, others were double not only by multiplication of petals, but also by the partial substitution of petals for stamens; thus in one of these last-mentioned flowers, there were four sepals, three rows of petals, one of the innermost row being partly staminoid, and eight stamens in a single row. Of these eight stamens, six were perfect and the remaining two partially petaloid, one lobe of the ordinarily 4-celled anther being destitute of pollen, but enlarged into a relatively large petal-like lobe with inflected margins. So that according to the old notion, this flower affords an instance both of progressive and of retrogressive metamorphosis, of enhanced and of arrested development associated with compensatory changes. On the hypothesis revived by Mr. Grant Allen—for it is no new notion —the two outer rows of petals would be stamens flattened out of all knowledge, while the inner row and the staminal whorl would, I presume, also afford him evidence of the truth of his opinion. For my own part I prefer to adhere to the established order of things, in which the horse precedes, rather than follows the cart, and I do so because to do otherwise would be to run counter to what we know of the homologies of the foliar and floral organs, of leaf-buds and flower-buds, and to ignore or rather to reverse what we know of the mode and order of development of flowers in general.

Not being aware of the precise order of evolution in the flower in question, I can only reason from analogy when I express my opinion that the changes it presents and the order of arrangements of its parts from the leaves on the flower-stems up to the pistil are more consistent with the generally adopted views of morphology than they are with Mr. Grant Allen's. According to his views, so far as I understand them, I can see no reason why the sepals as well as the petals should not be flattened stamens, and if the sepals why not the bracts? if the bracts why not the leaves? The theory would thus do away with the possibility of indigestion in plants, or at least the primordial plant, could not have been troubled in this way, for it would have had no digestive organs.

I have only to add that the flowers in question offered no explanation of the great peculiarity presented by the existence of a single row of stamens in number double that of the petals. Possibly this may be the result of bifurcation at a very early stage of development. It was hardly to be expected that they would throw any light on the equally curious "obdiplostemonous" arrangement in the nearly-allied genus *Platytheca*, in which there are two rows of stamens, the outermost being superposed or opposite to the petals, instead of being alternate with them, as is usually the case in stamens so placed. A possible explanation of this in a sense partly consistent with Mr. Allen's views would be to consider the petal as in this case an outgrowth from the stamen, and not a separate organ, a view that has been propounded in the case of Primulaceæ and some Malvaceæ. MAXWELL T. MASTERS

Fruit of Opuntia

DR. ERNST'S abnormal fruit of Opuntia, as figured at p. 77, appears to be similar to one described and illustrated by Zuccarini (*Abhandl. d. math. phys. Class.*, B. iv., Abth. 1., tab. ii.) in the case of *Cereus serpentinus*, but as Dr. Ernst gives no details as to the arrangement of the vascular bundles, it is impossible to say that the two cases are exactly parallel. The resemblance to certain gourds (Cucurbits), wherein the upper part of the fruit protrudes beyond the dilated end of the flower-stalk, may also be pointed out. MAXWELL T. MASTERS

Hawk Moth Larva

I FORWARD a sketch of the larva of a hawk moth found in the Khasi Hills, Assam, in the position it assumes when disturbed. Its resemblance to a snake will be at once evident.

The head (just visible in the sketch) and two first segments of the body are retracted, and the third pair of

pale horn colour have a rough resemblance to lower jaw or teeth. Small imperfect ocelli in the third segment might be taken for nostrils. The ocellus on the 5th segment, which however, is not so conspicuous as that on the 4th, rather spoils the general effect.

The colour is olive brown reticulated with black and imitates a reptile's scales very perfectly. The lower parts are black,

and a portion of the anterior segments dirty yellowish white. I do not yet know the perfect insect. The larva feeds on the wild balsam. The general colour of this larva at once reminded me of two abnormally coloured larvæ of the common death's-head moth that I had brought to me from a potato field in Jersey some years ago, together with others of the ordinary colour.

One was full grown and another half grown. The general colour of these was brown with fine black markings and without a trace of green. The anterior segments were a pale dirty cream colour. There were no ocelli or diagonal stripes on the sides.

I have not seen recorded any similar case of abnormal colouring in the larva of the death's-head moth, but the fact is interesting as indicating a common ancestry in two moths which are probably now classed in different genera.

E. R. JOHNSON
Surgeon Major, Bengal Medical Department
Shillong, October 16

[The form of death's-head larva alluded to is not uncommon; it is a dimorphic condition and finds its parallel in many larvæ of Sphingidæ. ED.]

The Fertilisation of the Common Speedwell

ALTHOUGH it is the wrong time of the year for observing flowers, it will perhaps not seem out of place to draw the attention of your readers to the fertilisation of the common Speedwell (*Veronica officinalis*). The flowers in the plant hang downwards, so as to bring the nearly flat corolla a little under the perpendicular. The two stamens project outwards and downwards on each side of the pistil, which also hangs down, but not so much as the stamens. These latter are very much narrowed at the base. The flower is in this species, proterandrous, and the corolla, as soon as the stamens have shed their pollen, becomes slightly loose.

It at first sight seems quite impossible for either cross or self-fertilisation to take place, as the stamens are quite away from the pistil, and, owing to the position of the flower, insects are compelled to alight in front.

One morning last summer, however, in considering the structure of the flower, &c., I was led to conclude that the explanation must lie in the insect's mode of settling upon it, and accordingly watched two or three plants. In about half an hour's time I had the pleasure of seeing a large fly in the act of fertilisation. As the corolla was flat, and the flower hung down, there was no foothold there, so the insect clasped each of the stamens with its forefeet. Being thin at the base, they were drawn together, and the anthers meeting just below the pistil, dusted the front of its head with the pollen.

On comparing a large number of flowers, I found that when just open, the pistil stood up above the point at which the two anthers would meet, but that in older flowers, especially after the anthers had shed their pollen, it was inclined downwards, If this observation is verified, it will show a most striking adaptation for preventing self-fertilisation.

I may add that in one of the smaller flowered species, *V. hederæfolia*, the stamens and pistil are quite close to each other, so that self-fertilisation must here be the rule. The corolla is also not so easily detached. A. MACKENZIE STAPLEY

The Owens College, Manchester, November 20

Wartmann's Rheolyzer

YOU gave in NATURE a report on "Wartmann's Rheolyzer." I beg to say that I invented and constructed the same apparatus long ago, and described it in the "Sitzungsberichte d. Wiener kast Akademie d. Wissenschaften," July, 1877, under the name of "Rheonom." Some months after that a fair report of my paper appeared in "Beiblätter zu Wiedemann's Annalen." My instrument was for some years in the hands of several physiologists. Prof. Yeo was present when I made experiments with it in Prof. Ludwig's laboratory in Leipzig in the year 1878, and Prof. E. du Bois-Reymond has it also in his collection of physiological and physical instruments for more than five years. There is no doubt that Prof. Wartmann was not acquainted with my apparatus when he described his, but I cannot be expected to see my invention ascribed to another and keep silent. So you will oblige me very much in correcting the above-mentioned mistake in your paper. ERNST VON FLEISCHE

Vienna, Währingerstrasse 11, November 30

Pollution of the Atmosphere

THERE was a letter in NATURE some time since, calling attention to the pollution of the atmosphere by the burning of coal; and it was calculated that in the year 1900, all animal life would cease, from the amount of carbonic dioxide; but the author had overlooked the fact that the rain is continually cleansing the atmosphere of this, and the fall of this rain on the ground, and the combination of this with various salts; besides, the oceans alone would absorb their own bulk at normal pressure, but at an increased pressure of, say half a mile deep, would dissolve more than we are likely to need for hundreds of years.

But there are other products of combustion, or rather of incomplete combustion, that are not brought down in this manner by rain, as hydrogen and the hydrocarbons, chiefly marsh-gas and ethylene. The latter has, I believe, been observed by the spectroscope on the Alps, and was supposed to have come from space.

Since the year 1854 (as near as I can estimate) there has been burnt 10,000 million tons of coal; and if we say (in its consumption by household grates, leakage by gas-pipes, &c.) 1-100th escapes, then 100 million tons of hydrogen and hydrocarbons are floating in the atmosphere, or 1-10,000,000th part in bulk; if we say the average proportion of hydrogen to be ·45, and of marsh gas ·35, and of ethylene ·4, we have ·84 per cent. of gases that are lighter than air, and it is more than probable that the law of diffusion of gases, as demonstrated with jars, does not apply to the atmosphere. The cases are not parallel: in the air we have unconfined space, pressure, and temperature diminishing infinitely, conditions favourable to the lighter and the gas with the greater amount of specific heat rising and maintaining its elevation, especially as we know that in *large* halls carbonic dioxide is found in larger quantities on the floor. According to Prof. Tyndall's researches, hydrogen, marsh gas, and ethylene have the property in a very high degree of absorbing and radiating heat, and so much so that a very small proportion, of only say one thousandth part, had very great effect. From this we may conclude that the increasing pollution of the atmosphere will have a marked influence on the climate of the world. The mountainous regions will be colder, the Arctic regions will be colder, the tropics will be warmer, and throughout the world the nights will be colder, and the days warmer. In the Temperate Zone winter will be colder, and generally differences will be greater, winds, storms, rainfall greater. H. A. PHILLIPS

Tanton House, Stokesley, November 23

A Modern Rip Van Winkle

WHEN Mr. Evans asks whether it is impossible for "the so-called flint implements and flint flakes to have been formed by natural causes" he surely must have had a scientific nap of forty or fifty years. He can answer his question by going to any good museum and inspecting the beautifully and clearly manufactured implements which the Curator will show him.

November 28 SALTBURN

GOOLDEN'S SIMPLE DIP-CIRCLE

A DIPPING-NEEDLE suitable for the requirements of schools and science classes has long been a desideratum, there having been no instrument obtainable hitherto which would at a moderate cost afford results of sufficient accuracy. Between the mere needle suspended in a simple stirrup of brass, and the delicate and complicated dip circles of standard pattern there has been no intermediate form of instrument. This deficiency, has, however, been remedied by Mr. Walter Goolden, M.A., Science Master in Tonbridge School, who, in conjunction with Mr. C. Casella, has designed the form of portable dip-circle depicted in the figure, which possesses several novel points. The needle, which is $3\frac{1}{2}$ inches in length, is poised upon an accurate axis working in sapphire centres, and magnetised once for all. In order to ensure the coincidence of the centre of gravity with the centre of suspension, two very light adjustible counterpoises are fixed to the needle, one of them being capable of being moved parallel to the length of the needle, the other lying at right angles to the first, and